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(54) **Combined cycle power plant**

Kraftanlage mit kombiniertem Kreislauf

Centrale à cycle combiné

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Description

The present invention relates to a combined cycle power plant according to the first portion of claim 1. Such a power plant is known from WO/84/04132. The invention further relates to a power station according to claim 5 comprising a plurality of trains of combined cycle power plants.

A conventional combined cycle power plant provided with an apparatus for removing iron oxides in condensate is disclosed in Japanese patent publication JP-3-63-59006 (1988). In said power plant, a gas turbine is supplied with fossil fuel and air to burn the fuel and driven by a high temperature combustion gas to rotate a generator thereby to effect a first stage power generation. Next, a high temperature exhaust gas from the gas turbine is fed to a boiler in which steam is generated and the exhaust gas having been lowered in temperature through the generation of the steam is exhausted. The steam is fed to a steam turbine to drive it and effect a second stage power generation by a generator connected to the steam turbine. Subsequently, an exhaust steam from the steam turbine is sent to a cooler in which the steam is caused to contact indirectly with a cooling water and cooled to be condensate. The condensate is fed to the boiler by a feed pump through a condensate demineralizer which employs H type cation exchange resin and OH type anion exchange resin. The condensate is treated of by the condensate demineralizer.

Said cycle power plant is constructed so that all the condensate to be fed to the boiler pass through the condensate demineralizer. Therefore, the total pump head of the feed pump increases and power consumption of the feed pump also increases. Further a larger capacity of demineralizer is required there because all the condensate to be fed to the boiler passes through the demineralizer.

In another conventional combined cycle power plant, a condensate recirculation line for recirculating a condensate in a condenser and a blow off line for removing iron oxides from feed water or condensate is provided in a condensate feed line for feeding condensate from a steam turbine to an exhaust heat recovery boiler at a downstream side of a feed pump mounted on the condensate feed line. At starting time of the power plant, the concentration of oxygen dissolved in the condensate is high, about several thousands ppb, the condensate can not be fed to the exhaust heat recovery boiler without any treatment of the condensate. Therefore, deaeration of the condensate is effected to the extent that requirement of the exhaust heat recovery boiler is satisfied, by recirculating the condensate from the condenser to the condenser through the condensate recirculation line and heating the condensate in the condenser with auxiliary steam fed to the condenser through an auxiliary steam line.

In this power plant, iron oxides in the condensate are removed by blowing off a part of condensate. For example, in the combined cycle power plant of around 1000 MW, a condensate of about 80 m^3 is blown off for about 50 minutes at the starting of the plant. The condensate blown off is compensated by introducing maked-up water into the condenser. As a result, a reduction effect of the dissolved oxygen is lowered by the introduction of the auxiliary steam, which results in increasing of the starting time of the power plant.

In another power plant disclosed in GB-A-751 173 a condensate recirculation line is connected with the condensate line downstream of a condensate pump and with the condenser. In said recirculation line is disposed a water treatment apparatus.

EP-A-0 152 920 shows a condenser for condensing steam exhausted from a steam turbine to form a condensate, comprising a condensate feed line and a condensate pump for feeding a condensate from said condenser to a boiler. A stop valve is disposed at a downstream side of said condensate pump. For deaerating a condensate in said condensate feed line deaerating means are provided with heating means for heating the condensate in said condenser at a predetermined time. A condensate recirculation line having a valve is connected to said condenser and to said condensate feed line at an upstream side of said stop valve and at a downstream side of said condensate pump for recirculating the condensate from and to said condenser via a part of said condensate feed line.

The object of the invention is to provide a combined cycle power plant which is able to remove iron oxides in the condensate with a miniaturized condensate treatment apparatus, when a deaeration by the condenser is effected, without increasing the total head and the power consumption of a condensate pump and a starting time of the power plant. A further object of the invention is to provide a power station, in which the water treatment can be effected for a plurality of combined cycle power plants at reduced installation costs.

These objects will be solved according to the invention by the features of claims 1 and 5, respectively.

According to the invention, a drum blow off water line is connected to a drum of the exhaust heat recovery boiler and to the condenser for blowing off a part of condensate in the drum. A water treatment apparatus is mounted on the drum blow off water line. The pressure difference is large between the boiler and the condenser so that the condensate is easily blown off into the condenser, and iron oxides of condensate in course of blow-off are removed by the water treatment apparatus provided on the drum blow off water line.

In this aspect of the present invention, iron oxides can be removed at the same time as the deaeration is effected in the condenser.

Embodiments of the invention are described below with reference to drawings, in which

Fig. 1 is a schematic diagram of a combined cycle power plant;

Fig. 2a is a sectional view of an electromagnetic filter;

Fig. 2b is a sectional view of a hollow-fiber filter;

Fig. 3 is a schematic diagram of a combined cycle power plant of an embodiment of the invention; and

Fig. 4 is a schematic diagram of a series of trains of combined cycle power plants of another embodiment of the invention.

In Fig. 1, the combined cycle power plant comprises a gas turbine 20 operated by a combustion gas produced by combustion of fuel 21 with air 22, a generator 23 connected to the gas turbine 20, an exhaust heat recovery boiler 25 having a drum 26 containing therein a condensate and heating the condensate with an exhaust gas sent there from the gas turbine 20 through an exhaust gas line 24, a steam turbine 28 driven by steam generated in the boiler 25 and sent thereto through a steam line 27, a generator 29 connected to the steam generator 28, a condenser 30 for condensing the steam exhausted from the steam turbine 28, a condensate feed line 31 which is inclusive of the condenser 30 and the drum 26 of the boiler 25 and provided with a condensate pump 32, a gland steam condenser 33 and a feed water (condensate) adjusting value 34, a condensate recirculation line 35 with a valve 36 connected to the condenser 30 and the condensate feed line 31 at a downstream side of the condensate pump 32 and at an upstream side of the feed water adjusting valve 34, and a water treatment apparatus 41 provided in the condensate recirculation line 35.

The condenser 30 has an auxiliary steam line 37 with a valve 38 as a heating means.

At a starting time of the power plant, the concentration of oxygen dissolved in the condensate is reduced by deaeration. The deaeration is effected by heating the condensate in the condenser 30 with auxiliary steam introduced into the condenser 30 through the auxiliary steam line 37 and by recirculation of the condensate through the recirculating line 35 by action of the condensate pump 32. When the concentration of the dissolved oxygen in the condensate reaches to an allowable extent, the valve 36 is closed and the condensate to be sent to the drum 26 starts to feed.

In this embodiment, the water treatment apparatus 41 is provided in the condensate recirculation line 35. Therefore, during the recirculation of the condensate at the starting time of the power plant, iron oxides in the condensate is removed by the water treatment apparatus 41. Namely, at the starting time of the power plant, the condensate in the condenser 30 is sent to the water treatment apparatus 41 by the condensate pump 32 through the gland steam condenser 33, the condensate feed line 31 and the condensate recirculation line 35, and iron oxides in the condensate are removed by the water treatment apparatus 41 when the condensate passes therethrough. Subsequently, the treated condensate from which iron oxides have been removed is returned to the condenser 30 through the condensate recirculation line 35 and the condensate recirculation valve 36.

During this recirculation of the condensate auxiliary steam is supplied into the condenser 30 through the auxiliary steam line 37, with the valve 38 being opened. The auxiliary steam heats, in vacuum, the condensate in the condenser 30 and deaerates the condensate to remove oxygen dissolved in the condensate to the extent that necessary conditions of the exhaust heat recovery boiler 25 are satisfied. After iron oxides in the condensate are removed and the concentration of the dissolved oxygen in the condensate is reduced, the condensate recirculation valve 36 and the auxiliary steam valve 38 are closed, the opening of the water feed adjusting valve 34 is adjusted, and the condensate in the condenser 30 is fed to the drum 26 of the exhaust heat recovery boiler 25 through the condensate pump 32, the gland steam condenser 33, the condensate feed line 31 and the feed water adjusting valve 34.

In this embodiment, iron oxides in the condensate is removed by the water treatment apparatus 41 provided in the condensate recirculation line 35, so that a pressure difference necessary for removing iron oxides is sufficient to be smaller than in the conventional heat recovery boiler which is previously mentioned. Therefore the condensate is sufficient to be one whose total pump head is small, so that power consumption can be reduced.

Further, iron oxides in the condensate can be removed by the water treatment apparatus 41, so that it is not necessary to blow off the condensate in order to remove iron oxides therein. Therefore, it is unnecessary to blow off the condensate in which the dissolved oxygen concentration has been reduced, so that a starting time of the power plant can be reduced and an amount of pure water to be used also can be reduced.

As the water treatment apparatus 41, an electromagnetic filter 41a or a hollow-fiber filter 41b is preferable.

The electromagnetic filter 41a is shown in Fig. 2a.

In Fig. 2a, the electromagnetic filter 41a comprises a casing 400, having an outlet 401 and an inlet for condensate, and supported by a support 403, a perforated support plate 405 disposed in the casing 400, spiral steel wool 406 disposed on the support plate 405, and an electromagnetic coil 404 wound the casing 400. When the condensate passes through the wool 406 while the coil 404 is energized, iron oxides are caught by the steel wool 406, and the concentration of iron oxide in the condensate which has passed through the steel wool 406 is reduced.

The iron oxides caught by the steel wool 406 can be separated from the steal wool 406 by deenergizing the coil 404 when it is necessary. The separated iron oxides are discharged out of the casing 400 together with the condensate.

In Fig. 2b, the hollow-fiber filter 41b is shown. In Fig.

2b, the filter 41b comprises a casing 410 supported on a support frame 414, and having an outlet 411 and an inlet 412, and a plurality of hollow-fibers 413 each of which is a very thin hollow tubular member having a plurality of holes in the wall portion.

In this filter 41b, water or condensate to be treated enters the interior of the casing 410 at the inlet 412, the water entered in the casing 410 penetrates into the interior of the hollow fibers through the fine holes at the wall portion while iron oxides in the water are prevented to enter the hollow fibers, and the water entered in the hollow fibers is collected at the outlet 411 and go out therefrom.

In the above-mentioned manner, iron oxides or foreign matters included in the water or condensate are removed.

Another embodiment will be described hereunder referring to Fig. 3 showing a system diagram of a combined cycle power plant.

In Fig. 3, the same parts or members have the same reference numerals as in Fig. 1 and the description of the same parts or members is omitted. In this embodiment, the drum 26 of the exhaust heat recovery boiler 25 is connected to the condenser 30 by a drum blow off water recovery line 42 with a drum blow off water recovery valve 43. A water treatment apparatus 44 is provided in this drum blow off water recovery line 42. An example of the water treatment apparatus 44 is an electromagnetic filter as shown in Fig. 2a or a hollow-fiber filter as shown in Fig. 2b, both of which apparatus are small in necessary pressure difference between an upstream sides and a downstream side of the water treatment apparatus 44.

In this embodiment, when the quality of drum water in the drum 26 of the exhaust heat recovery boiler 25 is worsened, a part of the drum water is taken up, the drum water is introduced in the water treatment apparatus 44 through the drum blow off water recovery line 42, and iron oxides in the drum water are removed. The treated water from which iron oxides are removed is returned to the condenser 30 through the drum blow off water recovery valve 43.

This embodiment is the same in construction and operation as the embodiment shown in Fig. 1 except that the drum blow off water recovery line 42 having the water treatment apparatus 44 and the valve 43 is provided instead of the water treatment apparatus 41 provided in the condensate recirculation line 35, and iron oxides included in the water or condensate are removed by the water treatment apparatus 44 when part of the drum water is blown off into the condenser 30.

Further another embodiment of the invention will be described hereunder referring to Fig. 4.

In Fig. 4 a plurality of trains of combined cycle power plants 45, 46, 47 are shown. Each combined cycle power plant 45, 46, 47 is the same as one in Fig. 1 or Fig. 3. The combined cycle power plants 45, 46 and 47 have water taking up lines 48, 49 and 50 and water returning lines 55, 56 and 57 connected thereto, respectively. The water taking up lines have change-over valves 51, 52 and 53, respectively, and are connected to a single common water recirculation line 54. The common water recirculation line 54 is provided with a water treatment apparatus 61 and connected, at a downstream side of the water treatment apparatus 61, to the water returning lines 55, 56 and 57 each of which has a change-over valve 58, 59, 60.

The water taking up lines 48, 49, 50, the water recirculation line 54 and the water returning lines 55, 56, 57 correspond to the condensate recirculation line 35 of the embodiment shown in Fig. 1, or to the drum blow off water recovery line 42 of the embodiment shown in Fig. 3.

As the water treatment apparatus 61, an electromagnetic filter as shown in Fig. 2a or a hollow-fiber filter as shown in Fig. 2b is used which is small in necessary pressure difference.

In this embodiment, when iron oxides in the condensate in the condenser of each combined cycle power plant 45, 46, 47 or in the drum water in the exhaust heat recovery boiler are removed, the change-over valves 51, 52, 53 of the water taking up lines 48, 49, 50 and the change-over valves 58, 59, 60 of the water returning lines 55, 56, 57 are opened. By this valve opening, water to be treated is introduced from the combined cycle power plants 45, 46, 47 to the water treatment apparatus 61 through the water taking up lines 48, 49, 50 and the water recirculation line 54. In the water treatment apparatus 61, iron oxides in the water are removed. The water having been treated by the water treatment apparatus 61 is returned to the combined cycle power plants 45, 46, 47 through the water recirculation line 54, the change-over valves 58, 59, 60 and the water returning lines 55, 56, 57.

Further, in this embodiment, water treatment of one or two of the plurality of trains of combined cycle power plants can be effected selectively by selectively opening a pair of the change over valves 51 and 58, a pair of the change-over valves 52 and 59 and a pair of the change-over valves 53 and 60 according to the selection of the combined cycle power plant to be treated of water.

The water treatment apparatus 61 is common to the combined cycle power plants 45, 46, 47, so that miniaturization of the water treatment apparatus for the plurality of trains of combined cycle power plants and installation cost reduction can be effected.

Claims

1. A combined cycle power plant comprising:

a gas turbine (20);
a generator (23) connected to said gas turbine (20) to generate electric power;
an exhaust heat recovery boiler (25) for heating

a condensate with exhaust combustion gas from said gas turbine (20) to generate steam;
a steam turbine (28) driven by the steam generated by said boiler (25);
a generator (29) connected to said steam turbine (28) to generate electric power;
a condenser (30) for condensing steam exhausted from said steam turbine (28) to form a condensate;
a condensate feed line (31) having a condensate pump (32) for feeding a condensate from said condenser (30) to said exhaust heat recovery boiler (25) and a stop valve (34) disposed at a downstream side of said condensate pump (32);
a water treatment apparatus (44) for removing iron oxides from the condensate,

characterized in *that*

- deaerating means for deaerating a condensate in said condensate feed line (31) include said condenser (30), heating means (37, 38) connected to said condenser (30) for heating the condensate in said condenser (30) at a predetermined time, and a condensate recirculation line (35) having a valve (36) and connected to said condenser(30) and to said condensate feed line (31) at an upstream side of said stop valve (34) and at a downstream side of said condensate pump (32) for recirculating the condensate from and to said condenser (30) via a part of said condensate feed line (31) and
- a drum blow off water recovery line (42) is connected to a drum (26) of said boiler and to said condenser (30), for blowing off a part of condensate from said drum (26) into said condenser (30), said water treatment apparatus (44) being provided in said drum blow-off water recovery line (42) so as to remove iron oxides in said blown off condensate.

2. Power plant according to claim 1, characterized in that said water treatment apparatus (44) is an electromagnetic filter (41a).

3. Power plant according to claim 1, characterized in that said water treatment apparatus (41) is a hollow-fiber filter (41b).

4. Power plant according to one of the claims 1 to 3, characterized in that said heating means (37, 38) comprises an auxiliary steam line (37) having a valve (38) and connected to said condenser (30) for heating the condensate in said condenser (30) at a deaeration time.

5. Power station comprising a plurality of trains of combined cycle power plants (45, 46, 47) each of which comprises a gas turbine (20), a generator (23) connected to said gas turbine (20) to generate electric power, an exhaust heat recovery boiler (25) for heating a condensate with exhaust combustion gas from said gas turbine (20) to generate steam, a steam turbine (28) driven by the steam generated by said boiler (25), a generator (29) connected to said steam turbine (28) to generate electric power, a condenser (30) for condensing steam exhausted from said steam turbine (28) to form a condensate, a condensate feed line (31) having a condensate pump (32) for feeding a condensate from said condenser (30) to said exhaust heat recovery boiler (25) and a stop valve (34) disposed at a downstream side of said condensate pump (32),
characterized in *that*

- each cycle power plant (45, 46, 47) comprises deaerating means for deaerating a condensate in said condensate feed line (31), said deaerating means including said condenser (30), heating means (37, 38) connected to said condenser (30) for heating the condensate in said condenser (30) at a predetermined time, and a condensate recirculation line (35) having a valve (36) and connected to said condenser (30) and to said condensate feed line (31) at an upstream side of said stop valve (34) and at a downstream side of said condensate pump (32) for recirculating the condensate from and to said condenser (30) via a part of said condensate feed line (31),
- each cycle power plant (45, 46, 47) has a drum blow off water recovery line (48, 49, 50, 55, 56, 57) connected to a drum (26) of said boiler and to said condenser (30), for blowing off a part of condensate from said drum (26) into said condenser (30), and
- a single water treatment apparatus (61) for all of said cycle power plants (45, 46, 47) is connected to said drum blow off water recovery lines (48, 49, *50,* 55, 56, 57) for removing iron oxides in the condensate blown off into said condenser (30).

Patentansprüche

1. Kraftwerk mit kombiniertem Kreislauf umfassend:

eine Gasturbine (20);
einen mit der Gasturbine (20) verbundenen Generator (23) zur Erzeugung elektrischer Energie;
einen Abwärme-Rückgewinnungskessel (25) zur Erwärmung eines Kondensats mit Verbrennungsabgas von der Gasturbine (20) zur Er-

zeugung von Dampf;
eine Dampfturbine (28), die durch den vom Kessel (25) erzeugten Dampf betrieben wird;
einen mit der Dampfturbine (28) verbundenen Generator (29) zur Erzeugung elektrischer Energie;
einen Kondensator (30) zum Kondensieren eines aus der Dampfturbine (28) entweichenden Dampfs zur Bildung eines Kondensats;
eine Kondensatzuleitung (31) mit einer Kondensatpumpe (32) zur Zuleitung eines Kondensats von dem Kondensator (30) an den Abwärme-Rückgewinnungskessel (25) und einem Absperrventil (34) stromabwärts der Kondensatpumpe (32);
eine Wasseraufbereitungseinrichtung (44) zur Entfernung von Eisenoxiden aus dem Kondensat,

dadurch gekennzeichnet, daß

- eine Entgasungseinrichtung zum Entgasen eines Kondensats in der Kondensatzuleitung (31) den Kondensator (30), eine mit dem Kondensator (30) verbundene Heizeinrichtung (37, 38) zum Erhitzen des Kondensats im Kondensator (30) an einem vorbestimmten Zeitpunkt und eine Kondensatrückführleitung (35) enthält, die ein Ventil (36) hat und mit dem Kondensator (30) und der Kondensatzuleitung (31) an einer stromaufwärts gelegenen Seite des Absperrventils (34) und einer stromabwärts gelegenen Seite der Kondensatpumpe (32) zur Rückführung des Kondensats von und zu dem Kondensator (30) über einen Teil der Kondensatzuleitung (31) verbunden ist, und
- eine Trommelablaß-Wasserrückgewinnungsleitung (42) mit einer Trommel (26) des Kessels und mit dem Kondensator (30) zum Ablassen eines Teils des Kondensats von der Trommel (26) in den Kondensator (30) verbunden ist, wobei die Wasseraufbereitungsvorrichtung (44) in der Trommelablaß-Wasserrückgewinnungsleitung (42) zur Entfernung von Eisenoxiden in den Ablaßkondensat vorgesehen ist.

2. Kraftwerk nach Anspruch 1,
dadurch gekennzeichnet, daß die Wasseraufbreitungsvorrichtung (44) ein elektromagnetischer Filter (41a) ist.

3. Kraftwerk nach Anspruch 1,
dadurch gekennzeichnet, daß die Wasseraufbereitungsvorrichtung (41) ein Hohlfaserfilter (41b) ist.

4. Kraftwerk nach einem der Ansprüche 1 bis 3,
dadurch gekennzeichnet, daß die Heizeinrichtung (37, 38) eine Hilfsdampfleitung (37) enthält, die ein Ventil (38) hat und mit dem Kondensator (30) zum Erhitzen des Kondensats in dem Kondensator (30) an einem Zeitpunkt der Entgasung verbunden ist.

5. Kraftwerksanlage mit mehreren Reihen von Kraftwerken mit kombiniertem Kreislauf (45, 46, 47) die jeweils eine Gasturbine (20), einen mit der Gasturbine (20) verbundenen Generator (23) zur Erzeugung elektrischer Energie, einen Abwärme-Rückgewinnungskessel (25) zur Erwärmung eines Kondensats mit Verbrennungsabgas von der Gasturbine (20) zur Erzeugung von Dampf, eine durch den vom Kessel (25) erzeugten Dampf angetriebene Dampfturbine (28), einen mit der Dampfturbine (28) verbundenen Generator (29) zur Erzeugung elektrischer Energie, einen Kondensator (30) zur Kondensation des von der Dampfturbine (28) abgeführten Dampfs zur Bildung eines Kondensats und eine Kondensatzuleitung (31) mit einer Kondensatpumpe (32) zur Zuführung eines Kondensats vom Kondensator (30) zu dem Abwärme-Rückgewinnungskessel (25) und einem Absperrventil (34) stromabwärts der Kondensatpumpe (32) umfassen,
dadurch gekennzeichnet, daß

- jedes Kraftwerk (45, 46, 47) eine Entgasungseinrichtung zur Entgasung eines Kondensats in der Kondensatzuleitung (31) umfaßt, wobei die Entgasungseinrichtung den Kondensator (30), eine mit dem Kondensator (30) verbundene Heizeinrichtung (37, 38) zum Erhitzen des Kondensats in dem Kondensator (30) an einem vorbestimmten Zeitpunkt und eine Kondensatrückführleitung (35) enthält, die ein Ventil (36) hat und mit dem Kondensator (30) und der Kondensatzuleitung (31) an einer stromaufwärts gelegenen Seite des Absperrventils (34) und einer stromabwärts gelegenen Seite der Kondensatpumpe (32) zur Rückführung des Kondensats von und zu dem Kondensator (30) über einen Teil der Kondensatzuleitung (31) verbunden ist,
- jedes Kraftwerk (45, 46, 47) eine Trommelablaß-Wasserrückgewinnungsleitung (48, 49, 50, 55, 56, 57) hat, die mit einer Trommel (26) des Kessels und mit dem Kondensator (30) zur Abführung eines Teils des Kondensats von der Trommel (26) in dem Kondensator (30) verbunden ist, und
- eine einzelne Wasseraufbereitungsvorrichtung (61) für alle Kraftwerke (45, 46, 47) mit dem Trommelablaß-Wasserrückgewinnungsleitungen (48, 49, 50, 55, 56, 57) zur Entfernung von Eisenoxiden in dem in den Kondensator (30) abgelassenen Kondensat verbunden ist.

Revendications

1. Installation de production électrique à cycle mixte comprenant :

une turbine à gaz (20);
un générateur (23) raccordé à ladite turbine à gaz (20) pour produire de l'énergie électrique;
une chaudière à récupération de chaleur d'échappement (25) pour le chauffage d'un condensat avec le gaz de combustion d'échappement provenant de ladite turbine à gaz (20) pour produire de la vapeur;
une turbine à gaz (28) entraînée par la vapeur produite par ladite chaudière (25);
un générateur (29) raccordé à ladite turbine à vapeur (28) pour produire de l'énergie électrique;
un condenseur (30) pour condenser la vapeur délivrée par ladite turbine à vapeur (28) pour former un condensat;
une canalisation (31) d'amenée de condensat comportant une pompe à condensat (32) pour entraîner un condensat depuis ledit condenseur (30) à ladite chaudière à récupération de chaleur d'échappement (25) et une soupape d'arrêt (34) disposée sur le côté aval de ladite pompe à condensat (32);
un dispositif (44) de traitement de l'eau pour éliminer des oxydes de fer du condensat,

caractérisée en ce que

- des moyens de désaération pour désaérer un condensat dans ladite canalisation (31) d'amenée de condensat comprennent ledit condenseur (30), des moyens de chauffage (37, 38) raccordés audit condenseur (30) pour chauffer le condensat dans ledit condenseur (30) à un instant prédéterminé, et une canalisation (35) de recirculation du condensat comportant une soupape (36) et raccordée audit condenseur (30) et à ladite canalisation (31) d'amenée de condensat, sur le côté amont de ladite soupape d'arrêt (34) et sur le côté aval de ladite pompe à condensat (32) pour faire recirculer le condensat en provenance et en direction dudit condenseur (30) par l'intermédiaire d'une partie de ladite canalisation (31) d'amenée de condensat, et
- une canalisation (42) de récupération d'eau de purge de réservoir est raccordée à un réservoir (26) de ladite chaudière et audit condenseur (30), pour purger une partie du condensat depuis ledit réservoir (26) dans ledit condenseur (30), ledit dispositif (44) de traitement de l'eau étant prévu dans ladite canalisation (42) de récupération d'eau de purge de réservoir de manière à éliminer les oxydes de fer dans ledit condensat purgé.

2. Installation de production électrique selon la revendication 1, caractérisée en ce que ledit dispositif (44) de traitement de l'eau est un filtre électromagnétique (41a).

3. Installation de production électrique selon la revendication 1, caractérisée en ce que ledit dispositif (41) de traitement de l'eau est un filtre (41b) formé de fibres creuses.

4. Installation de production électrique selon l'une quelconque des revendications 1 à 3, caractérisée en ce que lesdits moyens de chauffage (37,38) comprennent une canalisation de vapeur auxiliaire (37) possédant une soupape (38) et raccordée audit condenseur (30) pour chauffer le condensat dans ledit condenseur (30), à un moment de désaération.

5. Central électrique comprenant une pluralité d'installations de production d'électricité à cycle mixte (45,46,47), dont chacune comprend une turbine à gaz (20), un générateur (23) raccordé à ladite turbine à gaz (20) pour produire de l'énergie électrique, une chaudière à récupération de chaleur d'échappement (25) pour chauffer un condensat avec des gaz de combustion d'échappement provenant de ladite turbine à gaz (20) pour produire de la vapeur, une turbine à vapeur (28) entraînée par la vapeur produite par ladite chaudière (25), un générateur (29) raccordé à ladite turbine à vapeur (28) pour produire de l'énergie électrique, un condenseur (30) pour condenser la vapeur sortant de ladite turbine à vapeur (28) pour former un condensat, une canalisation (31) d'amenée de condensat comprenant une pompe à condensat (32) pour envoyer un condensat depuis ledit condenseur (30) à ladite chaudière à récupération de chaleur d'échappement (25) et une soupape d'arrêt (34) disposée sur le côté aval de ladite pompe à condensat (32), caractérisé en ce que

- chaque installation de production électrique à cycle (45,46,47) comprend des moyens de désaération pour désaérer un condensat dans ladite canalisation (32) d'amenée de condensat, lesdits moyens de désaération comprenant ledit condenseur (30), des moyens de chauffage (37,38) raccordés audit condenseur (30) pour chauffer le condensat dans ledit condenseur (30) à un instant prédéterminé, et une canalisation (35) de recirculation de condensat comportant une soupape (36) et raccordée audit condenseur (30) et à ladite canalisation (31) d'amenée de condensat sur le côté amont de

ladite soupape d'arrêt (34) et sur le côté aval de ladite pompe à condensat (32) pour la recirculation du condensat en provenance et en direction du condenseur (30) par l'intermédiaire d'une partie de ladite canalisation (31) d'amenée de condensat,

- chaque installation de production d'électricité à cycle (45,46,47) possède une canalisation (48,49,50,55,56,57) de récupération d'eau de purge de réservoir, raccordée à un réservoir (26) de ladite chaudière et audit condenseur (30) pour purger une partie du condensat depuis ledit réservoir (28) dans ledit condenseur (30), et
- un seul dispositif (61) de traitement de l'eau pour l'ensemble desdites installations de production électrique à cycle (45,46,47) est raccordé auxdites canalisations (48,49,50,55,56,57) de récupération de l'eau de purge du réservoir pour éliminer des oxydes de fer dans le condensat évacué dans ledit condenseur (30).

FIG. 1

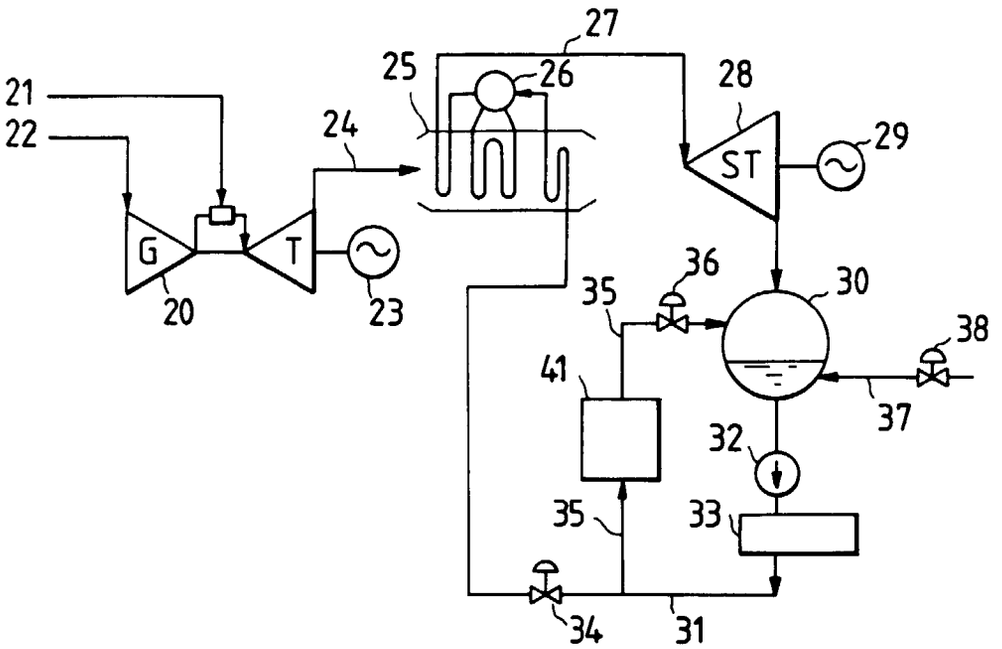

FIG. 2a

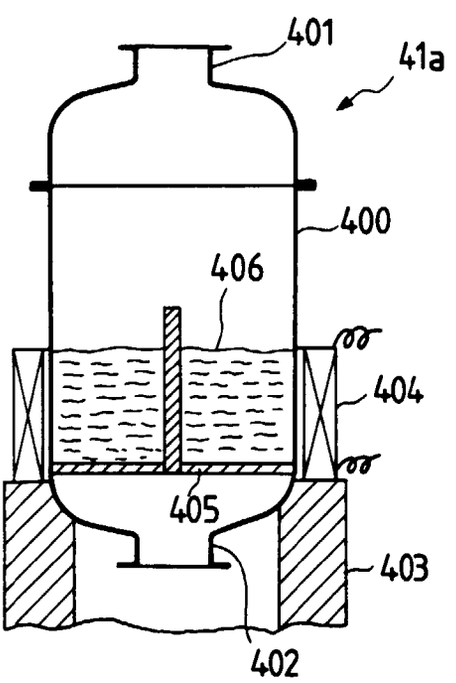

FIG. 2b

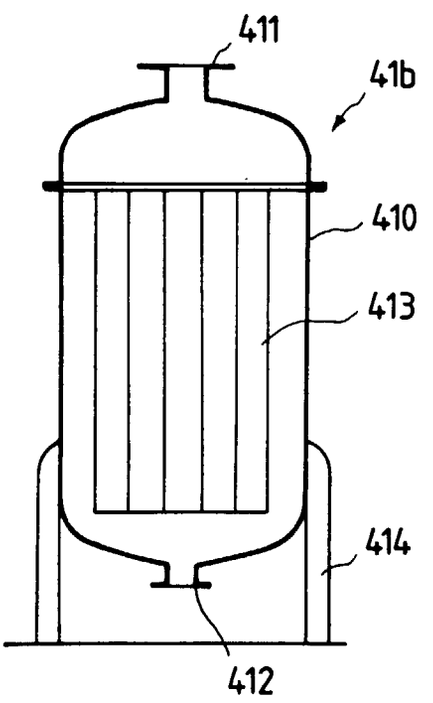

FIG. 3

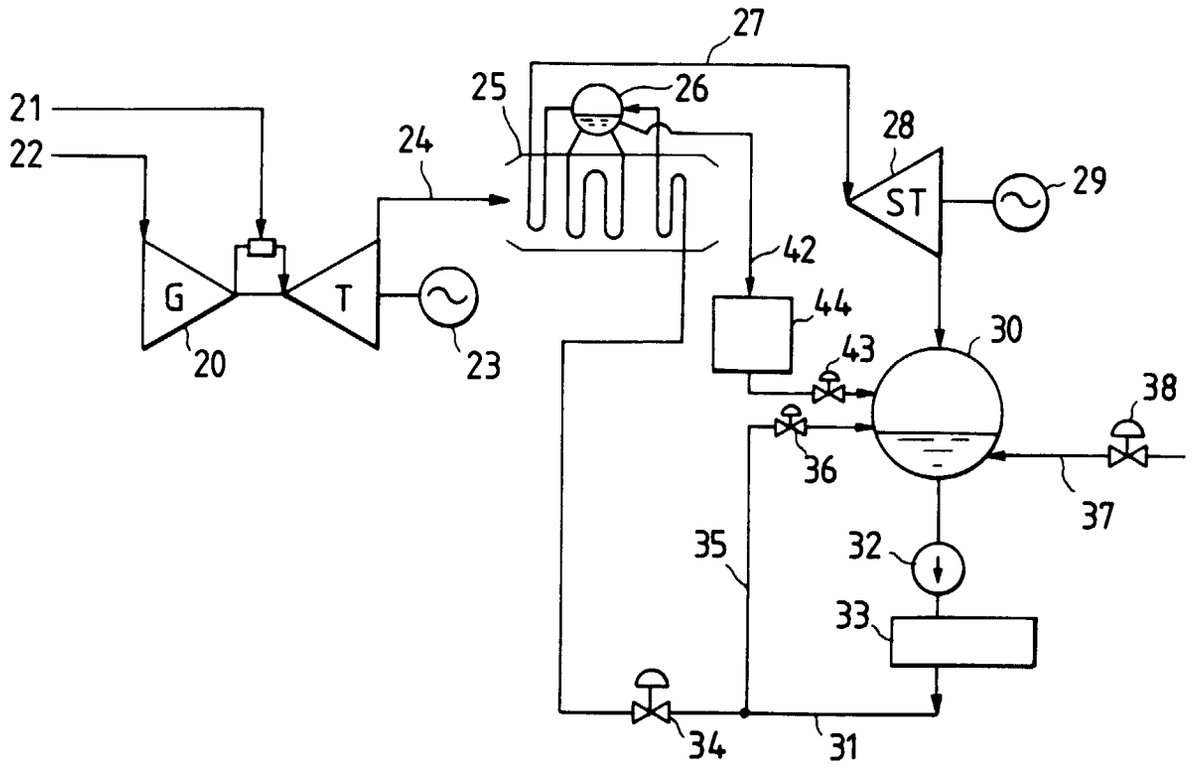
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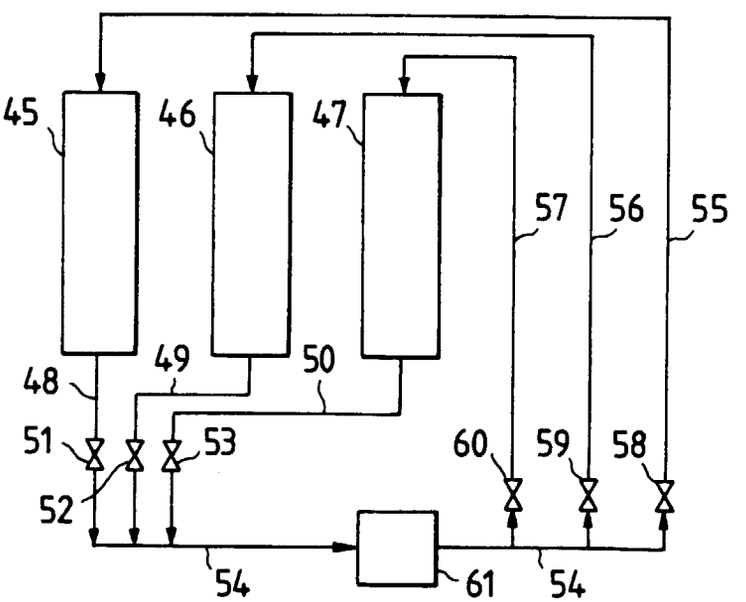
FIG. 4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